

WHAT IS CLAIMED IS:

1. An identification card printer comprising:
a card input;
a card transport configured to feed a card from
the card input along a print path;
a printhead below the print path and configured
to print an image on a surface of the card;
and
a card output through which the card is
discharged.
2. The printer of claim 1 including a supply of
print ribbon extending between supply and take-up
spools and across a gap, wherein the printhead is
positioned within the gap beneath the print ribbon.
3. The printer of claim 2, wherein the supply and
take-up spools are positioned adjacent opposite sides
of the printhead outside of the gap.
4. The printer of claim 2, wherein the supply and
take-up spools are positioned below the print path.
5. The printer of claim 2 including a removable
ribbon cartridge having a housing containing the
supply and take-up spools.

6. The printer of claim 2 including a ribbon sensor configured to detect ribbon panels of the print ribbon.

7. The printer of claim 6, wherein a component of the ribbon sensor is positioned adjacent the printhead.

8. The printer of claim 6, wherein a component of the ribbon sensor is mounted to the printhead.

9. The printer of claim 6, wherein a component of the ribbon sensor is positioned within the gap.

10. The printer of claim 6, wherein the ribbon sensor includes an emitter and a receiver that are positioned on opposite sides of the print ribbon.

11. The printer of claim 10, wherein the emitter is a light emitting diode (LED) configured to emit light having a wavelength of approximately 470 nanometers.

12. The printer of claim 6 including a second ribbon sensor configured to detect ribbon panels of the print ribbon.

13. The printer of claim 2 including a plurality of ribbon sensors each configured to detect ribbon panels of the print ribbon.

14. The printer of claim 1 including a removable ribbon cartridge containing a supply of print ribbon that extends between supply and take-up spools and across a gap.

15. The printer of claim 14, wherein the gap is defined by a pair of ribbon guides positioned between and above the supply and take-up spools.

16. The printer of claim 15, wherein the supply and take-up spools are positioned adjacent opposite sides of the printhead.

17. The printer of claim 14, wherein the supply and take-up spools are positioned below the print path.

18. The printer of claim 1 including a removable ribbon cartridge having a cartridge housing supporting supply and take-up spools, on which a supply of print ribbon is wound, the print ribbon extending over the printhead positioned within a gap between the supply and take-up spools.

19. The printer of claim 18, wherein the gap is less than approximately 0.75 inches wide.

20. The printer of claim 18, wherein the cartridge housing includes a supply spool enclosure containing

the supply spool, a take-up spool enclosure containing the take-up spool, and a plate joining the supply and take-up spool enclosures.

21. The printer of claim 20, wherein the ribbon cartridge includes a cleaner roller having a debris-collecting surface.

22. The printer of claim 18 including a cleaner roller supported by the cartridge housing, the cleaner roller including a debris-collecting surface.

23. The printer of claim 22 including a card cleaner roller having a debris-collecting surface configured to engage the debris-collecting surface of the cleaner roller and remove debris from the surface of the card.

24. The printer of claim 23, wherein the debris-collecting surface of the card cleaner roller is positioned adjacent a bottom side of the print path and between the printhead and the card input.

25. The printer of claim 1 including a card cleaner roller having a debris-collecting surface positioned adjacent a bottom side of the print path between the printhead and the card input.

26. The printer of claim 18 including a supply circuit mounted to the ribbon cartridge, the supply circuit including a memory containing supply information relating to the supply of print ribbon.

27. The printer of claim 26 including a printer controller and a supply circuit reader, the printer controller configured to^a access the supply information using the supply circuit reader.

28. The printer of claim 26, wherein the supply information includes a lot code, a supplier code, a ribbon type, a security code, a printer configuration setting, a number of prints completed, or a number of prints remaining.

29. The printer of claim 28, wherein the supply information is encrypted.

30. The printer of claim 18 including:

- a supply circuit mounted to the ribbon cartridge, the supply circuit including a memory containing supply information that has been encrypted in accordance with a first encryption method; and
- a supply circuit reader configured to decrypt the supply information.

31. The printer of claim 30, wherein the supply circuit reader is further configured to re-encrypt the supply information in accordance with a second encryption method.

32. The printer of claim 31, wherein the second encryption method is different from the first encryption method.

33. The printer of claim 31 including a controller configured to decrypt the re-encrypted supply information.

34. The printer of claim 18 including:

- a supply circuit mounted to the ribbon cartridge, the supply circuit including a memory containing a value; and
- a supply circuit reader configured to decrement the value contained in the memory in response to use of the ribbon, and disable the memory when the value stored therein reaches a predetermined end value.

35. The printer of claim 34, wherein the value contained in the memory corresponds to a remaining print count.

36. The printer of claim 18 including:

a supply circuit mounted to the ribbon cartridge, the supply circuit including a memory having a plurality of memory banks containing a value;

a supply circuit reader configured to decrement the values contained in the memory banks in response to use of the ribbon, and disable each memory bank when the value stored therein reaches a predetermined end value.

37. The printer of claim 36, wherein the values contained in the memory banks correspond to a remaining print count.

38. The printer of claim 18 including a printer housing having a ribbon cartridge receiver configured to receive the ribbon cartridge.

39. The printer of claim 38, wherein the ribbon cartridge receiver is accessed through a front face of the printer.

40. The printer of claim 39, wherein the printer housing includes a front cover over the cartridge receiver.

41. The printer of claim 38, wherein the ribbon cartridge receiver includes a cartridge receiving guide configured to receive a cartridge loading guide

of the ribbon cartridge for vertical support of a front portion of the ribbon cartridge.

42. The printer of claim 41, wherein the cartridge receiving guide includes a channel and the cartridge loading guide includes a protrusion sized to slide within the channel.

43. The printer of claim 38, wherein the cartridge receiver includes first and second drive shafts respectively receiving the supply and take-up spools.

44. The printer of claim 38, wherein:

the cartridge housing includes a supply spool enclosure containing the supply spool and a take-up spool enclosure containing the take-up spool; and

the cartridge receiver includes a first chamber configured to receive the supply spool enclosure and a second chamber configured to receive the take-up spool enclosure.

45. The printer of claim 44, wherein the first and second chambers substantially conform to exterior surfaces of the supply and take-up spool enclosures respectively.

46. The printer of claim 45, wherein the exterior surfaces of the supply and take-up spool enclosures have different shapes.

47. The printer of claim 1 including an expansion module in line with the print path between the printhead and the card input or the card output.

48. The printer of claim 47, wherein the expansion module is a data encoder or a magnetic stripe writer.

49. The printer of claim 47, wherein the printer includes a housing having an expansion module bay configured to receive the expansion module.

50. The printer of claim 1 including an expansion module having a card receiver in card hand-off alignment with the card output and a card processing component.

51. The printer of claim 50, wherein the card processing component is a laminator, a data encoder, a magnetic stripe writer or a card flipper.

52. The printer of claim 50, wherein the expansion module attaches to an end of the printer adjacent the card output.

53. The printer of claim 1 including a controller configured to control the card transport and the printhead in response to a print job.

55. The printer of claim 1 including a control panel and a controller, the control panel having input controls configured to generate input signals to the controller, wherein the controller controls the printer in accordance with the input signals.

55. The printer of claim 54, wherein the control panel includes a display.

56. The printer of claim 1 including a controller and firmware contained in memory that is executed by the controller.

57. The printer of claim 56, wherein the firmware is upgradable.

58. The printer of claim 57 including a firmware loading module configured to decrypt and load encrypted firmware upgrades.

59. The printer of claim 1 including an input hopper configured to contain a stack of cards and present a top card to the card input.

60. The printer of claim 59 including a stack of cards in the input hopper, wherein the cards include a downwardly facing print surface on which an image is to be printed.

61. The printer of claim 60, wherein the input hopper includes a biasing mechanism that applies an upwardly directed force to the stack of cards, whereby a top card of the stack is presented to the card input for feeding along the print path by the card transport.

62. The printer of claim 61, wherein the biasing mechanism includes a base member supporting the stack of cards and a spring mechanism that applies the upwardly directed force to the base member.

63. The printer of claim 62 including a cover over the input hopper.

64. The printer of claim 1, wherein the print path is substantially flat between the card input and the card output, and is positioned above the printhead.

65. The printer of claim 1, wherein the card transport includes feed rollers.

66. The printer of claim 1 including a card sensor adjacent the print path.

67. The printer of claim 1, wherein the printhead includes print elements facing upward toward the print path.

68. The printer of claim 1, wherein the printhead is movable in a vertical direction.

69. The printer of claim 68 including a motor, a first cam member driven by the motor and a second cam member attached to the printhead, wherein movement of the first cam member by the motor moves the printhead through engagement with the second cam member.

70. The printer of claim 69 including a position sensor detecting a position of the printhead.

71. The printer of claim 1, wherein the printhead is movable between a print position, in which print elements are positioned adjacent the print path for printing on a bottom facing print surface of a card substrate, and an idle position in which the print elements are lowered relative to the print position.

72. The printer of claim 71 including a full-down position, in which the printhead is lowered relative to the idle position.

73. The printer of claim 72 including a printhead biasing mechanism configured to resist movement of the printhead from the full-down position.

74. The printer of claim 1, wherein the printhead is a thermal printhead.

75. The printer of claim 1, wherein the printhead is removable through an opening in a base.

76. An identification card printer comprising:
a card input;
a card transport configured to feed a card from the card input along a print path;
a printhead below the print path and configured to print an image on a surface of a card fed by the card transport along the print path;
a removable ribbon cartridge containing a supply of print ribbon that extends between supply and take-up spools and over the printhead;
and
a card output through which cards are discharged.

77. The printer of claim 76 including a ribbon sensor adjacent the printhead and the print path, the ribbon sensor configured to detect ribbon panels of the print ribbon.

78. The printer of claim 77, wherein the ribbon sensor includes an emitter and a receiver that are positioned on opposite sides of the print ribbon.

79. The printer of claim 78, wherein the emitter is a light emitting diode (LED) configured to emit light having a wavelength/frequency within a range of 470 nanometers.

80. The printer of claim 77 including a second ribbon sensor configured to detect ribbon panels of the print ribbon.

81. The printer of claim 76, wherein the ribbon cartridge includes a cartridge housing supporting the supply and take-up spools in supply and take-up spool enclosures, respectively, the supply and take-up spool enclosures separated by a gap in which the printhead is positioned.

82. The printer of claim 81, wherein the supply and take-up spools are positioned below the print path.

83. The printer of claim 76, wherein the ribbon cartridge includes a cleaner roller having a debris-collecting surface.

84. The printer of claim 81 including a cleaner roller supported by the cartridge housing, the cleaner roller including a debris-collecting surface.

85. The printer of claim 84 including a card cleaner roller having a debris-collecting surface configured to engage the debris-collecting surface of the cleaner roller and remove debris from a bottom-facing surface of a card as it is fed along the print path by the card transport.

86. The printer of claim 85, wherein the card transport includes the card cleaner roller.

87. The printer of claim 85, wherein the debris-collecting surface of the card cleaner roller is positioned adjacent a bottom side of the print path and between the printhead and the card input.

88. The printer of claim 76, including a card cleaner roller having a debris-collecting surface positioned adjacent a bottom side of the print path between the printhead and the card input.

89. The printer of claim 76 including a supply circuit mounted to the ribbon cartridge, the supply circuit including a memory containing supply information relating to the supply of print ribbon.

90. The printer of claim 89 including a printer controller and a supply circuit reader, the printer controller configured to access the supply information using the supply circuit reader.

91. The printer of claim 89 wherein the supply information includes a lot code, a supplier code, a ribbon type, a security code, a printer configuration setting, a number of prints completed, and a number of prints remaining.

92. The printer of claim 76 including a ribbon cartridge receiver in which the ribbon cartridge is received.

93. The printer of claim 92, wherein the ribbon cartridge receiver includes a cartridge receiving guide configured to receive a cartridge loading guide of the ribbon cartridge for vertical support of a front portion of the ribbon cartridge.

94. The printer of claim 93, wherein the cartridge receiving guide includes a channel and the cartridge loading guide includes a protrusion sized to slide within the channel.

95. The printer of claim 92, wherein the cartridge receiver includes first and second drive shafts respectively receiving the supply and take-up spools.

96. The printer of claim 76 including an expansion module in line with the print path between the printhead and the card input or the card output.

97. The printer of claim 96, wherein the expansion module is a data encoder or a magnetic stripe writer.

98. The printer of claim 76 including a controller configured to control the card transport and the printhead in response to a print job.

99. The printer of claim 76 including a control panel and a controller, the control panel having input controls configured to generate input signals to the controller, wherein the controller controls the printer in accordance with the input signals.

100. The printer of claim 76 including a controller and firmware contained in memory that is executed by the controller.

101. The printer of claim 100 including a firmware loading module configured to decrypt and load encrypted firmware upgrades.

102. The printer of claim 76 including an input hopper configured to contain a stack of cards and present a top card to the card input.

103. The printer of claim 102 including a stack of cards in the input hopper, wherein the cards include a downwardly facing print surface on which an image is to be printed.

104. The printer of claim 103, wherein the input hopper includes a biasing mechanism that applies an upwardly directed force to the stack of cards, whereby a top card of the stack is presented to the card input for feeding along the print path by the card transport.

105. The printer of claim 76, wherein the print path is substantially flat between the card input and the card output, and is positioned above the printhead.

106. The printer of claim 76, wherein the card transport includes feed rollers.

107. The printer of claim 76 including a card sensor adjacent the print path.

108. The printer of claim 76, wherein the printhead includes print elements facing upward toward the print path.

109. The printer of claim 76, wherein the printhead is movable in a vertical direction.

110. The printer of claim 109 including a motor, a first cam member driven by the motor and a second cam member attached to the printhead, wherein movement of the first cam member by the motor moves the printhead through engagement with the second cam member.

111. The printer of claim 109 including a position sensor detecting a position of the printhead.

112. The printer of claim 76, wherein the printhead is movable between a print position, in which print elements are positioned adjacent the print path for printing on a bottom-facing print surface of a card substrate, and an idle position in which the print elements are lowered relative to the print position.

113. The printer of claim 112 including a full-down position, in which the printhead is lowered relative to the idle position.

114. A method of printing on a card comprising:

- a) presenting a card to a card input;
- b) feeding the card along a print path with a card transport; and
- c) printing on a surface of the card with an upwardly facing printhead.

115. The method of claim of claim 114 including providing a stack of cards in an input hopper, wherein a top card in the stack is presented to the card input in the presenting step a).

116. The method of claim 115 including applying an upwardly directed force to the stack of cards.

117. The method of claim 114 including d) discharging cards through a card output.

118. The method of claim 117 including collecting discharged cards in an output hopper positioned below the card output.

119. The method of claim 118, wherein the discharged cards are collected in the output hopper with the printed surface of the card facing downward.

120. The method of claim 117, wherein the print path is substantially flat between the card input and the card output.

121. The method of claim 114 including cleaning debris from the bottom surface of the card prior to the printing step c).

122. The method of claim 114, wherein the printing step c) includes transferring print material from a

thermal print ribbon that extends over the printhead and under the surface of the card.

123. The method of claim 122 including providing the thermal print ribbon in a removable ribbon cartridge.

124. The method of claim 123, wherein the ribbon cartridge includes a supply circuit having a memory containing supply information relating to the ribbon cartridge, the method includes reading the supply information from the memory prior to performing the printing step c).

125. The method of claim 123 including installing the ribbon cartridge in a cartridge receiver prior to the feeding step b).

126. The method of claim 114 including raising the printhead to a print position prior to the printing step c).

127. A method of aligning active print elements of a printhead to a card comprising:

- a) receiving a print job from a card processing application;
- b) receiving an offset value for the printhead;
- c) offsetting a set of active print elements of the printhead designated by the print

- job by the offset value to designate a modified set of active print elements; and
- d) processing the print job using the modified set of active print elements.

128. The method of claim 127, wherein the offsetting step c) includes ripping the print job with a printer driver to generate a print file that has been modified in accordance with the offset value, whereby the print file designates the modified set of active print elements.

129. A method of aligning active print elements of a printhead of a printer to a card comprising:

- a) receiving a print job from a card processing application;
- b) generating print image data from the print job that designates an original set of active print elements of the printhead to be used to process the print file;
- c) receiving an offset value from the printer; and
- d) re-generating the print image data that designates a modified set of active print elements of the printhead that are offset from the original set of active print elements by the offset value.

130. A method of operating an identification card manufacturing device that includes a consumable supply including a supply circuit having a memory comprising:

- a) storing a value in the memory;
- b) decrementing the value contained in the memory in response to use of the supply;
and
- c) disabling the memory when the value reaches a predetermined end value.

131. The method of claim 130 including preventing operation of the identification card manufacturing device with the supply when the memory is disabled.

132. The method of claim 130, wherein the identification card manufacturing device is a printer and the consumable supply is a print ribbon.

133. An identification card manufacturing device comprising:

- a consumable supply;
- a supply circuit mounted to the consumable supply and including a memory having a value stored therein; and
- a supply circuit reader configured to decrement the value in the memory in response to use of the supply and disable the memory when

the value stored therein reaches a predetermined end value.

134. The device of claim 133 including a controller configured to prevent operation of the device with the consumable supply when the memory is disabled.

135. The device of claim 133, wherein the consumable supply is a print ribbon.

136. An identification card manufacturing device comprising:

- a consumable supply;
- a supply circuit mounted to the supply, which contains supply information that has been encrypted in accordance with a first encryption method;
- a supply circuit reader configured to decrypt the supply information; and
- a controller configured to receive the supply information from the supply circuit.

137. The device of claim 136, wherein the supply circuit reader is further configured to re-encrypt the supply information in accordance with a second encryption method that is different from the first encryption method, and the controller is configured to decrypt the re-encrypted supply information.

138. The device of claim 136, wherein the consumable supply is a print ribbon.

139. A method of operating an identification card manufacturing device that includes a consumable supply including a supply circuit having a memory containing supply information that has been encrypted in accordance with a first encryption method, the method comprising:

- a) decrypting the supply information with a supply circuit reader; and
- b) providing the supply information to a controller.

140. The method of claim 139 wherein:

the decrypting step a) includes a step a)1) of re-encrypting the decrypted supply information in accordance with a second encryption method that is different from the first encryption method using the supply circuit reader;

the re-encrypted supply information is provided to the controller in the providing step b); and

the method includes c) decrypting the re-encrypted supply information with the controller.

141. The method of claim 140, wherein the consumable supply is a print ribbon.